

RESPONSE UNDER 37 C.F.R. § 1.116

EXPEDITED PROCEDURE – Art Unit 1762

Attorney Docket No. 108298715US

Disclosure No. 03-0117.00/US

REMARKS

Claims 2-21 are presently pending in this application. Claims 14 and 15 were held to present allowable subject matter, and thus have been rewritten in independent form to include the subject matter of the respective base claim.

The status of the application in light of the Office Action mailed May 13, 2005 is as follows:

(A) Claims 12-13 and 16-21 were rejected under 35 USC § 102(b) as being anticipated by published US Patent Application No. 09/848,533, Publication No. 2002/0007790 ("Park").

(B) Claims 2-11 have been allowed, and claims 14 and 15 have been held as being allowable if rewritten in independent form.

As a preliminary matter, the undersigned wishes to thank the Examiner for considering the IDS statement submitted on March 17, 2005. The undersigned notes that it appears that two of the references were not initialed. The first reference is US Patent No. 3,630,769 on page 4 of the IDS and the second reference is US Patent No. 579,269 on page 6 of the IDS. The undersigned requests that the Examiner review and initial these references and provide copies of the newly initialed pages to the undersigned for the applicant's records.

A. Response to Section 102(b) Rejection

Claims 12-13 and 16-21 were rejected under 35 USC § 102(b) over Park. As described below, the rejection of claims 12-13 and 16-21 should be withdrawn because Park does not disclose or suggest all of the features of these claims.

(a) Claim 12 is Directed to a Method for Processing Microfeature Workpieces

Claim 12 is directed at a method for processing microfeature workpieces, including cleaning an inner surface of a process chamber, and after the cleaning but prior to depositing material on a first microfeature workpiece, depositing a coating on

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the cleaned surface of the process chamber by contemporaneously introducing a gaseous first precursor and a gaseous second precursor to the process chamber to deposit a first reaction product at a first deposition rate. The method further includes positioning the first microfeature workpiece in the process chamber after depositing the coating. After positioning the first microfeature workpiece, the method still further includes depositing a second reaction product on a surface of the microfeature workpiece at a second rate lower than the first rate by depositing a precursor layer of the first precursor at least one monolayer thick and exposing the precursor layer to the second precursor to form a nanolayer reaction product.

(b) Park Discloses a Precoating Process for a Reactor and a Process for Depositing a Thin Film on a Surface of a Wafer

Park discloses a precoating process that is performed without a wafer in the reactor using two steps (paragraphs 92-95). The first step consists of mixing a flow-controlled TiCl₄ gas and an Ar gas and spraying the combination onto a wafer block and then excluding the TiCl₄ gas for a period of time (paragraphs 92-94). The second step consists of mixing an NH₃ gas and a flow-controlled Ar gas and spraying the combination toward the edges of the wafer block and then excluding the NH₃ gas for a period of time (paragraphs 92-94). In Park, the first and second steps are alternately repeated (paragraph 94) or the first step is repeated while the NH₃ and Ar gases are continuously introduced.

The wafer coating process disclosed in Park is similar to the precoating process, except that there is a wafer in the reactor during the precoating process (paragraph 95). The wafer coating process in Park deposits a thin TiN film on a wafer by alternately introducing a TiCl₄ gas and an NH₃ gas into a reactor (paragraph 65). Park further describes the process as introducing AR into a reactor that has an internal pressure of 10⁻⁴~5x10⁻³ torr (paragraphs 64). As the AR is introduced, the internal pressure of the reactor is raised to 1 to 10 torr via a pressure measuring portion and throttle valve (paragraphs 64). Thereafter, the process includes (a) introducing a TiCl₄ gas with an Ar gas and then excluding the TiCl₄ gas for a predetermined period of time, and alternately (b) introducing an NH₃ gas and an Ar gas and then excluding the NH₃ gas for a

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predetermined period of time to continuously grow a thin film on a wafer (paragraphs 65-68).

- (c) Park Fails to Disclose, Among Other Features, Depositing a First Reaction Product on a Surface of a Process Chamber at a First Rate and Depositing a Second Reaction Product on a Surface of a Microfeature Workpiece at a Second Rate Lower Than the First Rate

Parks fails to disclose or suggest the combination of elements set forth in claim 12. For example, Park does not disclose a method for processing microfeature workpieces that includes depositing a coating on the cleaned surface of a process chamber by contemporaneously introducing a gaseous first precursor and a gaseous second precursor to the process chamber to deposit a first reaction product at a first deposition rate and depositing a second reaction product on a surface of the microfeature workpiece at a second rate lower than the first rate. Although Park provides flow rates for the TiCl₄ gas, the Ar gas mixed with the TiCl₄ gas, the NH₃ gas, and the Ar gas mixed with the NH₃ gas during the wafer coating process (paragraph 72), Park does not disclose a rate of growth of the thin film on the wafer. Additionally, Park does not disclose the flow rates of the TiCl₄, NH₃, and Ar during the precoating process and does not disclose the deposition rate of the precoating on the wafer block during the precoating process. Accordingly, Park does not disclose depositing a first reaction product on a surface of a process chamber at a first deposition rate and depositing a second reaction product on a surface of a microfeature workpiece at a second rate, which is lower than the first rate.

Park also does not inherently disclose that the precoating step has a higher deposition rate than the wafer coating step. In the above referenced Office Action, the Examiner agrees that Park states that the precoating process disclosed in Park is *similar* to the thin film deposition process disclosed in Park, and admits that this disclosed similarity does not support that the two processes have the same operating conditions. As noted by the Examiner, Parks states:

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[T]he pre-coating process is very similar to a thin film deposition process in terms of deposition conditions. That is, as in a thin film deposition process . . . the temperature of the wafer w during thin film deposition is maintained at 400 to 600° C., and the temperature of lines connected to the reactor 100 is maintained at 40 to 200°C (paragraph 95).

The Examiner goes on to reason that the precoating process in Park where the NH₃ and Ar gases are continuously introduced will have a higher deposition rate than the thin film deposition process where a thin TiN film is formed on a wafer by alternately introducing a TiCl₄ gas and an NH₃ gas into a reactor. The applicant respectfully disagrees because the deposition rate is dependent on many factors other than the temperature of the wafer or wafer block and the temperature of the lines connected to the reactor.

Park does not address the deposition rate of the thin film on the wafer or the deposition rate of the precoating on the wafer block. The deposition rate can be influenced by many variables, such as the flow rate of the gases, the frequency of application of each gases, the temperature of the surface, the temperature of the gases, the concentration of the reactants, and the composition of the surface upon which the reactant product is being deposited. As noted by the examiner, simply because Parks states that the wafer coating process and the precoating process are similar, it does not mean that the two processes have the same operating conditions. Additionally, not only is Park silent on the deposition rate, Park is also silent on many of the parameters that influence deposition rates.

For example, in Park's Mass Flow Controllers (MFCs) control the flow of the inert gas and both reactant gases (paragraphs 47-50). As discussed above, although Park discloses gas flow rates during the wafer coating step, this reference does not disclose the flow rate of the gases during the precoating process. As noted by the Examiner, just because the processes are similar does not mean that the MFCs provide the same flow rates during both processes. Additionally, although Park discloses that the reactor pressure is raised to 1 to 10 torr during the wafer coating process, the internal pressure of the reactor is not specified during the precoating process. Park is also silent regarding the frequency of application of each gas in each process, the composition of

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the surface being coated during the precoating process, and the composition of the wafer that is being coated during the wafer coating process. Again, as noted by the Examiner, simply because Park discloses the precoating process and wafer coating process as being similar does not support the assumption that these parameters are the same during both processes, and variations in these parameters can significantly affect the deposition rates of the respective processes. Accordingly, the conclusion that Park discloses a higher deposition rate during the precoating step than during the wafer coating step is not necessarily true, and thus this is not an "inherent" feature of Park.

Additionally, even if all of the operating conditions were the same during Park's precoating process and wafer coating process accept that NH₃ is flowed continuously during the precoating process, it does not necessarily follow that the precoating process will have a higher deposition rate than the wafer coating process. In both processes, a TiN film is formed by introducing a TiCl₄ gas and an NH₃ gas into a reactor. As discussed above, the deposition rate is influenced by the amounts of the first and second reactants (see also Park paragraph 36). Even if an excess of NH₃ is provided by a continuous flow of NH₃ gas during the precoating process, the pulsing of the TiCl₄ gas would limit the amount of TiCl₄ available to form the TiN film. Assuming the same pulse duration and pulse increment of TiCl₄ gas, the amount of TiCl₄ gas would be the same in both processes. Accordingly, it does not follow that Park's precoating process inherently has a higher deposition rate than the wafer coating process. Furthermore, if the relative concentration of reactant gases change (e.g., the amount of NH₃ to the amount of TiCl₄), the efficiency of the reaction may also be affected. If the efficiency of the reaction changes, the corresponding deposition rate can also be affected. For example, in some cases, increasing the concentration of one reactant as compared to another can reduce a deposition rate. Again, the undersigned fails to see how one can conclude Park discloses a higher deposition rate during the precoating step than during the wafer coating step, and accordingly, this is not an "inherent" feature of Park.

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Therefore, for at least these reasons claims 12 is in condition for allowance. Additionally, claims 13 and 16-21 depend from claim 12. For at least this reason claims 13 and 16-21 are also in condition for allowance.

B. Allowable Subject Matter

The undersigned thanks the Examiner for allowing claims 2-11 and holding claims 14 and 15 as being allowable if rewritten in independent form. As discussed above, claim 14 and 15 have been rewritten in independent form and, for at least this reason, are in condition for allowance. Although the applicant's attorney agrees with the Examiner's conclusion that these claims are allowable, the applicant's attorney notes that the claims may be allowable for reasons other than those identified by the Examiner and does not concede that the Examiner's characterizations of the terms of the claims and the prior art are correct.

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the applied art. The applicant accordingly requests reconsideration of the application and a Notice of Allowance. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-6477.

No fees are believed due with this communication. However, the Commissioner is hereby authorized and requested to charge any deficiency in fees herein to Deposit Account No. 50-0665.

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Respectfully submitted,

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